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THE DIAGNOSIS AND TREATMENT OF OESOPHAGEAL IMPACTION IN DOGS WITH SPECIAL REFERENCE TO TRANSTHORACIC OESOPHAGOTOMY*

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The incidence of ingested foreign bodies causing oesophageal impaction in almost all breeds of dogs is remarkable when their accommodating digestive physiology and apparently well-developed instincts of self-preservation are considered. The purpose of this paper, however, is the diagnosis of these impactions and more particularly their removal.

Firstly, what types of foreign bodies are most commonly found impacting the dog's oesophagus? The term foreign body is used to imply anything which is ingested and, failing to reach the stomach, causes oesophageal obstruction. There seems no doubt that the most common of these objects are usually cooked bone fragments and frequently the split vertebra of a lamb, a whole vertebra of rabbit and sometimes of a fish. Other bone fragments likely to become impacted are portions of an epiphysis, vertebral processes, portions of ribs and sometimes the complete heads of rodents or birds. Pieces of cartilage, too, sometimes are impacted. Recorded foreign bodies of other than animal origin cover a fairly wide range and, in the writer's experience, include a complete solid rubber ball, safety pin, hat pin, and a mass of wire wool.

The size of a foreign body is directly related to the risk of its failure to reach the stomach, but perhaps more important is the shape. Anything sharply irregular or spiculated, although comparatively small, may well become firmly fixed at some point in the oesophagus.

Complete obstruction is unusual as sufficiently large regularly spheroidal objects rarely seem to be swallowed and it is common enough for a dog with oesophageal obstruction to take fluids, most of which will percolate to the stomach. Thus, in spite of progressive loss of condition, an animal may survive a long period by retaining liquid food while consistently vomiting solids.

The sites for oesophageal obstruction are commonly:—

(1) The terminal portion and stomach cardia.
(2) Above the heart and slightly posterior to it.
(3) The entrance to the chest immediately anterior to the first pair of ribs.

INCIDENCE

Almost any breed or type of dog is liable to oesophageal impaction, but it appears that the most commonly affected are those up to about large terrier size.

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CLINICAL SYMPTOMS

The persistent vomition of solid food shortly after its ingestion is probably the most important symptom, at least in the earlier stages. Some relation exists between the position of the impaction and the interval between the ingestion of solids and their vomition. This interval, in cervical impactions, normally would be much shorter than in thoracic ones, but the difference might amount to little more than seconds. Oesophageal obstruction commonly induces frequent laboured swallowing movements, the purpose of which is unmistakable, but the symptom is seldom well marked in posterior thoracic obstructions. Varying degrees of excessive salivation is another generally consistent symptom and the positive cases are seldom seen without slightly "wet mouths." In impactions of long standing the animal has lost condition and, weakened by continued failure to retain solids, no longer makes the attempt. In these cases any fever and respiratory symptoms indicate breakdown in the oesophageal wall with infection of the mediastinum or pleura.

POSITIVE DIAGNOSIS

This is usually possible by endoscopic examination under general anaesthesia and gives a reliable confirmatory diagnostic method, while the passage of a probang or sound is almost as valuable. Caution is, however, very necessary, whether it is simply in the passage of a sound, or of an endoscope for visual examination. In impactions other than those of recent occurrence, ulceration of the mucosa and underlying musculature at the site of obstruction seriously weakens the oesophageal wall with the result that any pressure on the incarcerated mass may rupture the oesophagus and so open it to the chest cavity. The possibility of a probang or endoscope passing a foreign body without revealing its presence must be borne in mind. X-ray examination is important and should, if possible, never be omitted. Generally it is sufficient to provide positive diagnosis assuming the X-ray film or screen image is of good quality and the veterinary surgeon has some experience of X-ray diagnosis. The use of barium or bismuth "swallows" will often give very convincing evidence of the presence of a foreign body which, on account of its size or indifferent radio-opacity, might otherwise be overlooked.

DIFFERENTIAL DIAGNOSIS

Two conditions in dogs have clinical symptoms similar to those of oesophageal impaction. One is what appears to be congenital atony of the oesophageal musculature causing oesophageal dilatation and persistent vomition of most solid and semi-solid ingesta. Atresia of the stomach cardia has been cited as the possible important factor. The other in this connection is even more obscure in origin and, in the writer's view, can be described as a laryngo-pharyngitis with submaxillary lymphadenitis. The animal salivates profusely and persistently, while every attempt at deglutition stimulates vomition. In both conditions endoscopic and X-ray examination under general anaesthesia

is usually sufficient to preclude the presence of oesophageal obstruction.

Treatment

Cervical Impactions

Obstructions in the cervical oesophagus, unless caused by very irregularly shaped or spiculated masses, often can be removed under general anaesthesia by extraction *per os*. Long forceps of the crocodile pattern are best suited and, with such an instrument, the risk of damaging the oesophageal mucosa is minimal. The withdrawal of the foreign body must be cautious and the attempt abandoned in favour of simple cervical oesophagotomy if there is any doubt in the operator's mind that the traction exerted is likely to cause oesophageal damage. Cervical oesophagotomy is a surgical operation, which, it is assumed, need not be described in this paper.

Thoracic Impactions

Some foreign bodies, especially those of animal origin such as bone or cartilage fragments, can be most expeditiously dismissed by propulsion into the stomach and no doubt many such impactions, which have resisted all the animal's voluntary and involuntary efforts to dislodge, reach the stomach after little more than a touch with the probang or endoscope. Clearly this applies more to the impaction at or very near the stomach cardia which, if it can be made safely to enter the stomach, seldom causes any further trouble.

Extraction *per os*

Again, under general anaesthesia, it is sometimes possible to grasp and extract with suitably long crocodile forceps a foreign body impacted in the thoracic oesophagus, but ordinarily the risks and difficulties are much greater than those met in the cervical portion. Nevertheless, it is a fact that, under general anaesthesia, a percentage of thoracic obstructions, provided they have not been *in situ* too long, can be extracted safely *per os*. On the other hand, although the oesophagus is capable of wide dilation, puncture resulting in septic infection of the mediastinum or pleural cavity is a primary risk, whether the oesophagus has undergone inflammatory or necrotic changes from the size of the impaction, its duration, or both. Extreme care must be exercised in the extraction of foreign bodies held in the thoracic oesophagus, and when the obstruction has existed long enough to cause deterioration in bodily condition, or X-ray examination contraindicates traction, another means to relieve the condition should be sought.

Low Cervical Oesophagotomy

This is an operation sometimes adopted as a means of facilitating extraction of foreign bodies from the thoracic portion, but, in the writer's experience, unless the impaction is uncommonly situated immediately posterior to the first pair or ribs, there appears little or no advantage in the operation. A foreign body which can be withdrawn along the oesophagus to a point anterior to the first pair of ribs might then well complete the course to the mouth along the comparatively hazardless cervical portion.

Laparogastrotomy

The presence of impactions at or near the stomach cardia sometimes invites removal by laparogastrotomy and, in certain cases where a comparatively small obstruction nevertheless resists propulsion into the stomach and cannot be grasped for extraction *per os*, the approach is a practical one. The difficulties of success by this approach are mainly in the intrinsically blind nature of manipulation of the foreign body into the stomach and the related problem of adequate sphincter dilation. The danger lies in the risk of manipulation puncturing the oesophagus before the foreign body is eventually freed and removed.

Transthoracic Oesophagotomy

Indications

The operation may well be considered when, in thoracic impactions:—

(1) The size and shape of the obstructing foreign body from X-ray examination suggests that extraction with forceps *per os* is likely to rupture the oesophagus.

(2) Symptoms of a complicating pleurisy or mediastinitis already are shown.

(3) Very carefully applied gentle traction has failed to release the impaction.

Clearly it is impossible even to attempt the formulation of any rule by which the operation is indicated or contraindicated, but, with the necessary facilities, my experience has shown that in any case where the extraction of an impacting foreign body *per os* might reasonably involve a risk of oesophageal laceration and communication to the mediastinum or chest cavity, the safer course is transthoracic oesophagotomy.

Pre-operative Antibiosis

The dog's pleural cavity may very easily become infected as the result of thoracotomy, but, as in practically every field of clinical canine surgery, penicillin injected intramuscularly appears to make an important contribution in prophylaxis. Equally important no doubt is the continuation of the treatment for a few days after operation. Daily dosages of 10,000 units (standard oil or watery solution) per lb. bodyweight have been used effectively.

Preparation of the Operation Site

This simply entails the close clipping of the whole of the left chest wall. Shaving is not essential if a fine clipper head is available. After clipping it is desirable to brush the animal carefully but thoroughly to remove as much loose and cut hair as possible from the unclipped parts. The skin may be sterilised by whatever method the operator favours, but washing with soap and water followed by a wide application of surgical spirit appears to be effective.

Positive Pressure Ventilation of the Lungs

Pneumothorax and death from asphyxiation very soon follow surgical opening of the chest in dogs unless some means of artificial respiration can be adapted to the circumstances. A few methods to serve this purpose have been described, but during the past two years the writer has used an apparatus evolved with the help of and made by Mr. C. R. Wood, M.R.C.V.S., D.V.S.M. The apparatus provides interrupted positive pressure ventilation of the lungs and consists of a mechanically operated piston-type valve, which controls the frequency of a variable tidal volume of air delivered to the lungs through a close-fitting or cuffed intratracheal tube. The valve-open position allows lung inflation by positive pressure. The valve-closed position allows expiration by normal recoil. The apparatus provides for the controlled enrichment of air by oxygen and the insufflation of anaesthetic vapours as necessary, flowmeters being interposed in both air and oxygen circuits. The valve mechanism is operated electrically and

Gordon C. Knight : Transthoracic Oesophagotomy

Scottish terrier bitch aged eight months. Portion of lamb vertebra impacting posterior part of oesophagus for eight days. Removed by transthoracic oesophagotomy after resection of the eighth left rib. Dog discharged three days after operation.

the speed variable from about three or four to 80 tides per minute. The source of air can be either a motorised blower or a cylinder. Endotracheal tubes with distal inflatable cuffs can be obtained in sizes from No. 1 to 10, a range which will cover most breeds of dogs. These tubes are made of stout rubber with a thin walled rubber cuff encircling a distance of about 1½ inches near the distal extremity. The cuff is inflated from a syringe, a proximally placed pilot bulb serving as a guide to the amount of inflation required and as a tell tale in the event of puncture or accidental deflation. Inflation of the cuff ensures that all respiratory exchange is through the tube without leakage between the tube and tracheal mucosa.

Anaesthesia and Intubation

Transthoracic oesophagotomy requires deep surgical anaesthesia for which nembutal intravenously by the routine technique has been found suitable. When the animal has been deeply anaesthetised the cuffed endotracheal tube is passed into the trachea, the cuff inflated and its tube connection clamped. It is inadvisable to attempt intubation until a deep plane of anaesthesia has been reached. On widely opening the mouth of the anaesthetised dog the epiglottis is commonly wholly or partly obscured by the soft palate. Depression of the tongue posteriorly is usually sufficient to bring the epiglottis and laryngeal entrance into view and intubation with the suitably lubricated endotracheal tube should not be difficult provided the mouth is well illuminated. It is, however, sometimes helpful to put gentle traction on the glosso-epiglottic fold or apex of the glottis with forceps in order to expose the laryngeal opening sufficiently to permit intubation. The operation of transthoracic oesophagotomy throughout requires the presence of an experienced anaesthetist assistant well accustomed to intravenous technique and the use of positive pressure apparatus. To inhibit excessive secretion of mucus from the laryngeal and tracheal mucosa atropine sulphate 1/200 to 1/100 gr. injected intramuscularly is always indicated shortly before anaesthetisation.

The Operation

Routine aseptic precautions are, of course, required throughout and the operation needs at least one surgical assistant. The dog is placed on its side with the left chest uppermost and the limbs extended. Since resection of the rib directly over the impaction is a first step the exact course of the skin incision will depend upon the position of the foreign body as shown by a lateral radiograph of the chest. Most impactions requiring transthoracic removal are in that part of the oesophagus bounded by ribs eight to ten inclusive and, in the writer's experience, rib resection within this range meets the expected requirements of the operation. Thus, having decided from examination of an X-ray film which rib is to be resected, sterile drapes can be clipped to the skin to allow adequate exposure of the operation site. Location of the rib to be resected will be found by palpation counting postero-anteriorly, but in fat and small subjects it may not be easy. In these subjects the line of incision may be determined by directly relating the impaction to a point such as the xiphoid cartilage.

The first incision is through the skin and cutaneous muscle from a point high in the latissimus dorsi to just below the costo-chondral junction. Bleeding points should be dealt with before the incision is deepened and, where ligation is necessary, No. 90 linen thread is suitable. Deepening the incision the latissimus dorsi and external oblique muscles are cut and, depending on the position of the rib to be resected, the rectus abdominis and pectoral muscles. Vessels encountered usually require ligation and it is, of course, essential to control haemorrhage before proceeding. It should now be possible to identity the rib to be resected and a careful incision is made through the costal periosteum along the full length exposed. This is followed by separation of the periosteum from the rib with a suitable elevator and, with a little experience, the rib can be freed from its periosteum over the length to be resected without entering the chest cavity. A tenaculum, aneurysm needle or similar instrument should be passed between the rib and periosteum at some point and then moved gently up and down along the long axis of the rib to complete the separation of the periosteum.

With suitable shears the rib is now cut at the ventral and dorsal extremities of the periosteal separation and, if the operation has been carefully carried out, the pleural cavity will not have been entered. The unmistakable sound of air passage, however, will indicate the presence of any puncture. Whether or not at this stage the pleura is intact, the anaesthetist assistant should be ready with the positive pressure apparatus working at a tide frequency of about 15 per minute so that it may easily be coupled to the endotracheal tube when the operator gives the word that the chest cavity is opened. Incision of the intercostal muscle and pleura is best made with blunt-point scissors and should extend the whole length of tissues exposed by the rib resection. Positive pressure ventilation of the lungs now becomes essential, the volume of air and oxygen tide being controlled by the anaesthetist assistant and based on the colour of the animal's glossal and labial mucosa and its respiration. A self-retaining retractor is now used to retract the ribs widely and so give a good exposure of the thoracic oesophagus. At this stage it is advisable to devote a little time to stabilising the air and oxygen requirements before proceeding immediately with the operation. Generally, according to the dog's size, anything between 2 to 10 litres of air with a variable oxygen enrichment at about 15 tides per minute will suffice and at the same time not embarrass the operator by the lungs expanding over the oesophagus. The rhythmic inflation of the lungs to about one-third of their capacity appears adequate, but increase in the proportion of oxygen is always an important controlling factor. The location of the foreign body, which from X-ray examination has been judged to need transthoracic extraction, will not be difficult and in most cases the swollen area in the oesophagus is quite evident. Some inflammation involving the mediastinal pleura over the foreign body, or palpation of the oesophagus, will put the matter beyond doubt.

After a gauze swab has been packed in to limit the escape of any fluid from the wound, the mediastinal pleura and underlying musculature is incised over the impaction. It is desirable, and usually not difficult, to avoid section of the vagus nerve, the bifurcation of which is commonly anterior to the impaction. Haemorrhage from the oesophageal wound is diffuse and therefore not easily controlled, but tends to decrease spontaneously. If the foreign body is of animal origin its decomposing nature is noticeable before the mass itself can be seen. Haemorrhage and any escape of oesophageal contents can be removed from the operation site by continuous aspiration through a cannula connected to suction apparatus. Although in most operations this is found very convenient, its employment is not indispensable and the use of gauze swabs is effective.

The length of incision will depend on the size of the foreign body which, if grasped firmly with a robust form of rat-toothed forceps, often can be manipulated through a comparatively small opening. The extraction of the foreign body from the oesophagus is usually accompanied by further escape of fluid and care should be taken to have ample absorbent gauze packing in the vicinity if a suction cannula is not in use.

When the impaction has been extracted and gauze packs removed, penicillin in sterile sulphathiazole powder should be lightly insufflated or dusted through gauze into the chest cavity. The oesophageal wound can now be closed and a Cushing suture, using 3/0 or 4/0 20-day chromic catgut on a half- or full-curved atraumatic needle, is recommended. One row should invert the wound edges effectively without reinforcement. If at any points, however, a reinforcing interrupted suture appears necessary one or more can be used, but so far experience has shown that a second full-length inversion suture is unnecessary. When the operator is satisfied with the closure of the oesophageal wound

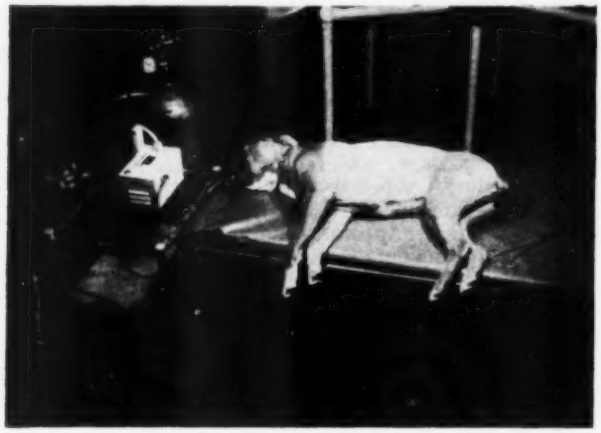

FIG. 1.—Boxer bitch prepared for transthoracic oesophagotomy and anaesthetised with nembutal intravenously. The animal has been intubated with a No. 9 Magill cuffed intratracheal tube and for the purposes of this photograph temporarily connected to the positive pressure apparatus. The larger cylinder contains compressed air and the smaller one oxygen.

FIG. 2.—Operation field

FIG. 3.—After incision of skin, fascia, latissimus dorsi and pectoral muscles.

FIG. 4.—Rib exposed after separation of periosteum and immediately prior to resection.

penicillin in sulphathiazole powder should again be insufflated into the chest and the ribs retractor removed in preparation for closing the chest wall. This can be satisfactorily accomplished by using a continuous suture of No. 2/0 to No. 2 chromic catgut, bringing together intercostal muscle and pleura. Only when the animal is small or thin and, on this account, the musculature and pleura are frail will it be found necessary to embrace ribs in this suture. The suture should end at about half a centimetre from the ventral limit of the intercostal muscle and pleural incision, thus leaving a small aperture, the purpose of which is to admit a small cannula just into the chest cavity. A single interrupted suture, tied lightly with one throw, is then placed in readiness to close this aperture. The positive pressure tide must now be slowed down to about three

Fig. 5.—Chest cavity opened, ribs widely retracted. Swelling of oesophagus at point of impaction is seen between the aorta above and a white gauze swab held below.

Fig. 6.—The larger of the two bone fragments being extracted through the oesophageal wound.

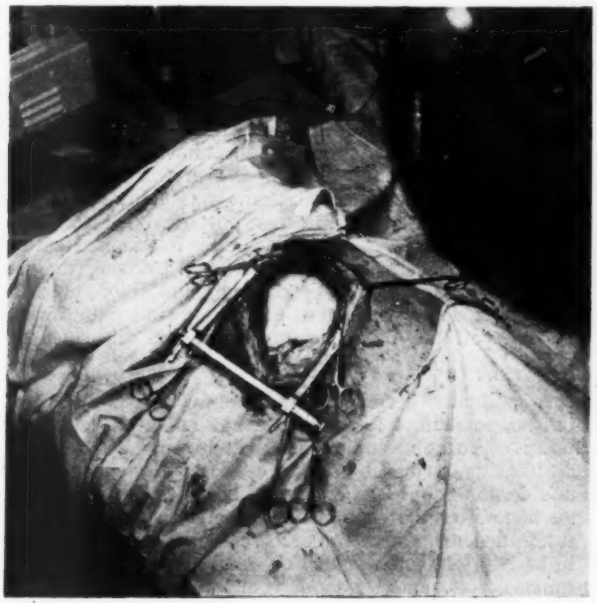

Fig. 7.—Immediately after closure of the oesophageal wound. The lungs inflated to illustrate the extent which will later be necessary to expel air from the pleural cavity when the final closure of pleura and intercostal muscle is made.

Fig. 8.—Completion of the operation. The resected portion of rib shown in comparison with the skin incision.

or four per minute and the volume adjusted to allow full lungs inflation. This technique serves to expel air from the pleural cavity and at the moment of full lungs inflation the cannula is withdrawn as the single interrupted suture is tied. Positive pressure ventilation may now be discontinued by disconnection of the apparatus from the endotracheal tube. The chest cavity having been sealed with air excluded, voluntary respiration should start within about 30 seconds. Careful observation of the visible mucosae and heart's action is necessary and, unless the quality of respiration is evidently adequate, positive pressure ventilation should be restored. In this event it can be assumed that some pneumothorax remains and a trochar and cannula may then be used to puncture the chest and so remove as much air as possible by aspiration. This operation when necessary is probably better postponed until the musculature and fascia have been sutured. For this purpose linen thread or chromic catgut as mattress or simple interrupted sutures can be used, occluding dead space and bringing the skin wound edges as nearly as possible into apposition. Finally, the skin is closed with interrupted nylon sutures into which a gauze pad may be included or sutured on subsequently.

Recovery

A gradually decreasing hyperpnoea is usually characteristic, sometimes for as long as 72 hours or more, after positive pressure ventilation is withdrawn. This is of no significance in the absence of cyanosis, for which careful and continual observation should be made for at least half an hour after the operation. Experience has shown that restoration of positive pressure ventilation is most unlikely to be required when voluntary respiration has proved continuously adequate for about 15 minutes.

Depending on the age and general condition of the dog, full recovery in the sense that the animal is able to walk is seldom delayed beyond 48 hours.

Post-operative Treatment

No untoward results seem to follow a little fluid being given as early as 24 hours after operation, but anything other than liquid food should be withheld for four days after operation. There is no objection to very restricted exercise as soon as the animal is able to stand and walk. No wound breakdown has been recorded in any case so far. Penicillin intramuscularly should be given daily for five days after operation and the writer has no doubt that its pre-operative use is mainly responsible for the clinically practical application of the operation.

Conclusions

With X-ray diagnostic aid and an easily operated positive pressure apparatus for ventilation of the lungs the operation requires nothing more than is ordinarily available to the veterinary surgeon with average facilities for small-animal surgery. Resection of a rib can be obviated by direct intercostal incision, but, in the writer's experience, this technique, although time saving, involves the serious risk of costo-vertebral fracture dislocation, a very painful condition in dogs and one which is likely to complicate recovery. Further, resection of a rib leaves two adjoining intercostal muscles which, together with the underlying pleura, when sutured together provide an adequate first layer for closure of the chest cavity.

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Since 1948, 22 dogs have had transthoracic oesophagotomy in the Beaumont Animals' Hospital, Royal Veterinary College, London. Before the new apparatus became available two of these dogs died from inadequate positive pressure ventilation. Subsequently one dog died from infection of the mediastinum, which had preceded operation, and another from oesophageal haemorrhage and shock. The remaining 18 dogs are believed to have made complete recovery.

Acknowledgments.—Mr. S. W. Douglas, M.R.C.V.S., and many past and present colleagues have given me invaluable help and advice in these operations. To all of them I express grateful thanks. Mr. C. R. Wood, M.R.C.V.S., D.V.S.M., as the result of long and painstaking perseverance has produced an apparatus of great value in small-animal thoracotomy and which has made positive pressure ventilation of the lungs a comparatively simple matter for a veterinary surgeon.

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FRUCTOSE ESTIMATION AND FRUCTOLYSIS OF ABNORMAL SEMEN: RESULTS OBTAINED IN THE FIELD

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Introduction

It has been shown by Mann (1946) that the reducing sugar in bull semen (Bernstein, 1933) is d, fructose; and that fructose can be estimated accurately and conveniently by reaction with resorcinol in acid solution (Mann, 1948). Fructose is a regular constitutent of the seminal plasma and is formed in the male accessory glands, chiefly the seminal vesicles, under the influence of testicular hormone (Mann and Parsons, 1947), (Mann, Davies and Humphrey, 1948). Once the accessory secretion has mixed at ejaculation, fructose diffuses into the cells, and under the influence of sperm enzymes and co-enzymes, is broken down with the liberation of energy and the accumulation of lactic acid (Mann, 1949).

The initial fructose level and rate of fructolysis have, however, been studied in only a few cases of infertility or sterility in the bull (Mann, 1948). It was therefore desirable during the examination of cases of infertility or sterility in bulls to determine the state of fructose metabolism. For this purpose it became necessary to determine if the examination could be carried out when the animals visited were situated at various distances from the laboratory.

Methods

It has previously been found that samples could be incubated satisfactorily in a vacuum flask in the laboratory (Mann, 1948). Then when examining bulls at some distance from the laboratory the method of choice appeared to be to remove portions of semen immediately after collec-

tion for determination of the initial fructose level, and to incubate further portions with phosphate buffer in small tubes placed in cotton wool damped with water at 37° C. in a 2-pint vacuum flask. Portions of semen can then be withdrawn and deproteinised at hourly intervals during the journey to the laboratory.

Use of a 2-pint vacuum flask allows a relatively large volume of water to be used, thus helping to maintain the temperature to the range 35° C. to 37° C. as recommended by Mann (1948).

Comparison of the temperature of fluid incubated by this method, using an N.P.L. tested clinical thermometer, showed falls in temperature over a three-hour period of 1·66° C. to 2·0° C. (Table I). During the summer months, when the estimations were carried out, the temperature in the vacuum flask was well maintained.

Table I

Flask	A		B		C	
Tube	I	II	I	II	I	II
Mean fall, °C. ...	1·72	1·84	1·97	2·00	1·66	1·75

Since other enzyme actions occur in semen under aerobic conditions, inaccuracy may occur, due to the jolting action of the vehicle during the return to the laboratory. This, however, is partly offset by the shock-absorbing action of wet cotton wool.

In order to ensure as far as possible a minimal heat loss during incubation of the sample it is necessary to fill the vacuum flask with as much damp cotton wool as possible. The tubes of buffered semen must be inserted into pockets in the centre of the damp wool mass, and space between the tops of the tubes and the cork of the flask filled with further wool. Thirdly, care is required in adjusting the flask to 37° C., which was done on the farm immediately prior to insertion of the sample tubes. The air space above the buffered semen in the tubes was made as small as possible, by using cottonwool bungs covered with grease-proof paper, with grease-proof paper packed into the tube until the air space was about 5 mm.

Chemical Estimation

The method used was that described by Mann (1948). The sample, after being mixed with half a volume of 0·25 M. phosphate buffer, *p*H 7·4, was incubated in plugged glass tubes placed in damp cotton wool at 37° C. in a 2-pint vacuum flask; the initial fructose level and the levels at one, two, three and sometimes four hours' incubation, were determined by deproteinising 0·1 ml. of the specimen in 1·9 ml. distilled water to which was added 1 ml. 2 per cent. zinc sulphate, and 1 ml. O.I.N. NaOH. Since at this stage the samples may be left for up to 12 hours, when the requisite time had elapsed, deproteinisation was carried out and the tubes were plugged, shaken and stored until arrival at the laboratory.

After return to the laboratory, the method described by Mann (1948) was followed exactly; a separate colour standard was prepared for each examination, using B.D.H. pure laevulose, and colour comparison was carried out in two 10 ml. measuring cylinders of identical make, type and calibration, using daylight and a white-tile background. Volumetrically these appear accurate to 0·05 ml.

Semen Characters

The general semen characters were determined according to the method of Haq (1949) and Rollinson (1950). These results are given in Table II (over-leaf).

Twenty-two ejaculates have been examined from eleven bulls on 13 occasions. The distance of the bulls from the laboratory varied from ten to 80 miles. The types of case examined are given in Table III.

Table III

Bull	Breed	Age	Conception rate. (Services per conception)	Remarks
Semen showing no Fructolysis				
ABR 118 ...	Friesian	3 years	Zero	Nodular necrosis affecting epididymis
ABR 126 ...	Guernsey	7 „	3·3	Brucella orchitis
ABR 127 ...	Friesian	16 months	Zero	Testicular hypoplasia
Sterile Bulls				
ABR 113 ...	Shorthorn	2 years	Zero	Re-examination after rest
ABR 123 ...	Jersey	20 months	„	Immature
ABR 124 ...	„	14 „	„	„
Infertile Bulls				
ABR ...	Guernsey	2½ years	1·25	Improved semen after rest
ABR 119 ...	Shorthorn	3 „	8·0	Herd infertile
ABR 120 ...	Jersey	3½ „	8·0	Herd infertile. Brucella infection
ABR 128 ...	Friesian	6 „	3·5	Check on semen characters
Fertile Bull				
ABR 122 ...	Guernsey	10 years	1·58	Old bull. Check on semen characters
ABR 122 (I) 2nd examination	„	10 „	2·0	Inflammation of seminal vesicles
ABR 122 (II) 3rd examination	„	10 „	—	Inflammation of seminal vesicles

Results

The fructose levels found and the Fructolysis index calculated are tabulated in Table IV (page 551). The Fructolysis index (Mann, 1948) is the amount of fructose used by 10^9 sperm, when incubated with 0·25 M. phosphate buffer at 37° C. The index has been calculated for each hour of incubation, thus giving an indication of variation in rate of fructose utilisation.

1. *Semen Showing no Fructolysis.*—Three cases (118, 126 and 127) showed no utilisation of fructose. All three cases were of oligospermia, numbers 118 and 127 being absolute, while 126 showed relatively few sperms. The former case revealed a generalised nodular necrosis affecting the superficial muscles (Hole, 1938), together with involvement of the epididymis on either side, causing blockage of the efferent ducts of the testes.

Case No. 126 was one of advanced epididymitis and orchitis of the right testicle, with epididymitis on the left side. It is of interest that, in spite of the inflammatory changes, the initial fructose levels were normal. Both samples from this bull contained many inflammatory cells,

TABLE II
GENERAL SEMEN CHARACTERISTICS

Bulls	Ejaculations	Appearance	Volume c.c.	pH	Density per cu. mm.	Motility					Abnormal sperm, %			Free P.D. per 100 sperm
						Initial	6 hours	24 hours	48 hours	72 hours	Head	Mid piece	Tail	
STERILE BULLS. AZOOSPERMIA														
ABR 118 ...	1	W	4·5	6·4	—	—	—	—	—	—	—	—	—	—
	2	W	6·2	6·4	—	—	—	—	—	—	—	—	—	—
ABR 126 ...	1	W	4·8	6·4	—	—	—	—	—	—	—	—	—	—
	2	W	4·2	6·4	—	—	—	—	—	—	—	—	—	—
ABR 127 ...	1	W	1·2	7·0	—	—	—	—	—	—	—	—	—	—
	2	W	4·2	6·6	—	—	—	—	—	—	—	—	—	—
STERILE BULLS														
ABR 113 ...	1	M	3·6	6·2	406,000	40 × 3	30 × 3	20 × 2	5 × 2	—	3·0	8·0	—	8
	2	M	3·6	6·4	406,000	50 × 3	40 × 3	30 × 3	10 × 2	—	1·3	11·3	—	7
ABR 123 ...	1	C	3·1	6·2	1,320,000	60 × 3	—	50 × 3	20 × 2	—	11·0	4·0	—	10
	2	C	3·2	6·4	1,480,000	80 × 4	—	60 × 3	30 × 3	—	12·6	6·6	—	3
ABR 124 ...	1	M	2·3	6·6	1,684,000	70 × 4	—	70 × 4	50 × 3	—	8·3	3·3	—	30
	2	M	2·1	6·6	1,284,000	80 × 4	—	60 × 4	50 × 3	—	13·0	4·0	—	6
INFERTILE BULLS														
ABR 102 ...	1	M	3·2	6·4	716,000	50 × 3	—	40 × 3	40 × 3	—	9·0	2·0	—	2
	2	M	2·5	6·6	600,000	70 × 4	—	50 × 3	30 × 3	—	9·0	3·3	0·6	3
ABR 119 ...	1	C	8·5	6·2	2,000,000	90 × 5	90 × 5	—	50 × 4	—	2·0	1·6	1·0	13
	2	M	5·3	6·4	300,000	60 × 4	50 × 3	—	30 × 3	—	3·3	1·6	—	Rare
ABR 120 ...	1	M	1·3	6·2	800,000	90 × 5	70 × 4	50 × 4	—	20 × 2	1·0	5·3	0·3	14
	2	M	3·8	6·0	900,000	90 × 5	80 × 5	80 × 4	—	40 × 2	1·6	1·0	—	12
ABR 128 ...	1	M	2·8	6·2	1,240,000	80 × 4	70 × 4	70 × 4	60 × 3	40 × 3	2·3	4·3	—	—
	2	M	4·2	6·4	1,288,000	90 × 5	80 × 4	75 × 4	60 × 3	10 × 2	2·3	4·3	—	—
FERTILE BULLS														
ABR 122 ...	1	C	5·9	6·6	1,400,000	70 × 4	60 × 3	—	—	30 × 3	3·3	11·0	0·3	9
	2	C	4·8	6·6	1,032,000	70 × 4	70 × 4	—	—	40 × 3	3·0	5·3	—	13
ABR 122 2nd examination	1	C	1·5	6·6	1,000,000	50 × 3	50 × 3	—	—	20 × 2	1·6	35·3	0·6	8
	2	C	4·2	6·6	888,000	70 × 4	70 × 4	—	—	30 × 3	3·6	16·3	—	6
ABR 122 3rd examination	1	C yellow and flaky	6·4	6·4	1,200,000	60 × 3	60 × 3	50 × 3	40 × 3	—	2·6	17·3	—	5
	2	C	5·2	6·6	840,000	70 × 4	70 × 4	50 × 3	30 × 3	—	3·6	9·0	—	3

chiefly polymorphonuclear leucocytes, the first ejaculate having almost twice the number per unit volume of the second ejaculate.

Case No. 127 is of interest, being a Friesian bull with extreme under-development of both testicles and epididymides. Unfortunately, only one semen examination could be carried out; this revealed how initial fructose, and absence of spermatozoa. The measurements of the testicles of this bull are given in Table V.

TABLE V

	Left testicle	Right testicle
Size, mm.	51 × 32 × 22	52 × 28 × 20
Weight, gms., including epididymis	48·04	54·9

The *glandulae seminalis vesicularis* weighed 50·4 grammes and showed a content of 1,100 mg. per 100 ml. fructose and citric acid 1,140 mg. per 100 ml., both figures being quite normal. Histological examination revealed marked underdevelopment of the testicular tubules with a good development of the interstitium. The *cauda epididymis* on each side showed vacuolation similar to that described by Barron and Haq (1948). Histological examination of the seminal vesicles was not carried out owing to anxiety to preserve the glands intact for analysis. It would appear, however, that the secretion of these glands was not available as part of the ejaculate.

2. *Sterile Bulls.*—Three young bulls with histories of sterility were examined. All were young animals and showed good, or moderate, semen characters (Table II). Of these bulls, two showed a normal initial fructose level, while in the other (Case 123), the figures were somewhat low. One case (113) showed poor density and motility,

TABLE IV

FRUCTOSE LEVELS AND FRUCTOLYSIS INDEX

The first figure after each type of tissue cell refers to the number of cells in the first ejaculate, the second figure to the number in the second ejaculate

Bulls	Ejaculation	Tissue cells (per cu. mm.)	Cultures (aerobic 48 hours)	Fructose mg. per 100 ml. After incubation with phosphate buffer at 35–37° C.					Fructolysis index After incubation with phosphate buffer at 35–37° C.			
				Initial	After 1 hour	After 2 hours	After 3 hours	After 4 hours	After 1 hour	After 2 hours	After 3 hours	After 4 hours
STERILE BULLS. AZOOSPERMIA												
ABR 118 ...	1	Sheath cells only present,	Haemolytic diphtheroids	990	—	—	—	990	0	—	—	0
	2	31–62	.. ..	654	—	—	—	654	0	—	—	0
ABR 126 ...	1	Sheath cells 61–94	Non-haemolytic diphtheroids	708	—	—	—	505	0	—	—	0
	2	Leucocytes 904–488	.. ..	600	—	—	—	593	0	—	—	0
ABR 127 ...	1	Sheath cells 1,250–136	Non-haemolytic diphtheroids	98	96	96	92	—	0	0	0	0
	2	.. ..	Few non-haemolytic diphtheroids	15	13	13	13	—	0	0	0	0
STERILE BULLS												
ABR 113 ...	1	Sheath cells 281–125 Boat-shaped cells 31–62	Non-haemolytic diphtheroids	620	600	448	63	—	0·44	3·8	9·5	—
	2	Spermatids 125–62	.. ..	647	549	439	473	—	2·4	2·7	—	—
ABR 123 ...	1	Sheath cells 0–31 Boat-shaped cells 563–500	Few non-haemolytic diphtheroids	303	—	72	46	—	—	2·5	0·19	—
	2	Spermatids 125–93	.. ..	396	—	243	72	—	—	1·04	1·15	—
ABR 124 ...	1	Sheath cells 93–62 Boat-shaped cells 594–312	Negative	384	199	123	95	—	1·1	0·45	0·17	—
	2	Spermatids 125–62	..	675	306	294	260	—	2·9	0·09	0·26	—
INFERTILE BULLS												
ABR 102 ...	1	Sheath cells 187–94 Boat-shaped cells 469–560	Pseudomonas species and non-haemolytic diphtheroids	620	227	153	140	91	5·45	1·03	0·18	0·68
	2	Spermatids 156–187		553	267	205	119	90	4·76	1·03	1·43	0·48
ABR 119 ...	1	Sheath cells 312–125 Boat-shaped cells 312–62	Haemolytic and non-haemolytic diphtheroids	675	—	150	78	—	—	2·6	0·36	—
	2	Spermatids 281–31 Multinucleated spermatids 31	.. ..	849	—	672	471	—	—	5·9	6·7	—
ABR 120 ...	1	Sheath cells 218–62 Boat-shaped cells 31–156	Non-haemolytic diphtheroids and proteus	612	—	280	24	—	—	4·15	3·2	—
	2	Spermatids 31–0	Non-haemolytic and haemolytic diphtheroids	423	—	211	77	—	—	2·33	1·49	—
ABR 128 ...	1	Sheath cells 94–0 Boat-shaped cells 687–406	Coliform	836	225	100	92	—	4·92	1·01	0·06	—
	2	Spermatids 0–62	..	608	129	66	51	—	3·71	0·48	0·12	—
FERTILE BULLS												
ABR 122 ...	1	Sheath cells 0–94 Boat-shaped cells 188–219 Spermatids 0–31	Non-haemolytic diphtheroids and proteus and pseudomonas pyocyanea	117	54	0	0	—	0·45	0	0	—
	2	Spermatocytes 31–0 Leucocytes 6,500–12,900	.. ..	135	0	0	0	—	0	0	0	—
ABR 122 2nd examination	1	Sheath cells 156–0 Boat-shaped cells 188–219	Proteus and pseudomonas pyocyanea	30	0	0	0	—	0	0	0	—
	2	Leucocytes 3,000–3,560	.. ..	38	0	0	0	—	0	0	0	—
ABR 122 ... 3rd examination	1	Sheath cells 31–31 Boat-shaped cells 408–156	Mixed diphtheroids and 16 pseudomonas pyocyanea	78	0	0	0	—	0	0	0	—
	2	Leucocytes 5,312–6,502	2 pseudomonas pyocyanea and 1 pseudo-pyocyanea	63	0	0	0	—	0	0	0	—

poor keeping quality and low fructolysis index (Table IV), while the percentage of abnormal sperm and numbers of tissue cells gave little cause for suspicion.

The two cases with good density, motility and keeping quality each showed raised percentages of abnormalities of the sperm head, while the fructolysis indices were also low.

3. *Infertile Bulls.*—Case No. 128 is included in these groups in view of the high figure for services per conception. The bull, however, was not suspected as the main cause, and the semen characters and history suggest that the low conception rate was rather related to the females in the herd. The bull had, however, been very heavily used, having given 198 services in 12 months. The semen *p*H, density, motility, keeping-quality and percentage of abnormal sperm were all excellent.

Case No. 119 was also heavily used for his age and seemed to have poor sperm reserves, as judged by the density of the second ejaculate.

Case No. 120 was a bull with a very bad history and excellent semen characters; he was used in a herd in which an active infection with *Brucella abortus* was the chief abnormality.

Case No. 102 was a young bull which started in poor condition with a poor conception rate; but he improved with more careful management so that the conception rate had eventually risen at the time of the re-examination to 1·25 services per conception on a small number of cows.

4. *Fertile Bull.*—Case No. 122 was primarily examined because of his age and value, there having been no question of his fertility being in doubt. This examination revealed low initial fructose, and high leucocyte count, with, however, good semen characters. At this stage the bull's record showed that nine out of eleven cows were in calf, following a single service in each case. Before a re-test was made he served four more cows and two held to a single service. Further tests confirmed a low initial fructose. Throughout this period, while the leucocyte count was increasing and, in fact, marked flakes could be seen in the sample, no causal organism could be isolated. The keeping quality was also satisfactory throughout.

Discussion

It has been found possible to study the fructose metabolism in semen from abnormal bulls situated at varying distances from the laboratory, by incubation and deproteinisation of the samples during the return journey. In some cases, *e.g.*, ABR 122, the samples were in the laboratory within 30 minutes of collection, while in other cases, *e.g.*, ABR 128, the return journey occupied three and a half hours.

No addition of antibiotic was used to control bacterial growth. All samples were collected into sterilised collecting cones and tubes to minimise bacterial contamination. The use of either penicillin or streptomycin is unlikely to have much effect on such organisms as proteus and coliforms which are known to utilise fructose (Bergey *et al.*). Pseudomonas species do not utilise fructose. The commonest organisms isolated are the diphtheroids, and while they may or may not utilise fructose the common bovine species *C. renale* and *C. bovis* do not normally metabolise this sugar.

In seven of these cases the relation between the initial fructose in the first and second ejaculates was inversely proportional to volume, while in three of the remaining cases differences were small.

In the series of cases reported neither initial fructose levels nor rate of fructolysis show any close connection with low-temperature viability time. On the other hand, a very low initial fructose is not inconsistent with good fertility (Case 122), and, likewise, in this case the absence of fructose after one hour did not appear to affect adversely the low-temperature viability time. While the most likely explanation of the low fructose content of the semen of this bull is inflammation of the seminal vesicles (Mann, 1950), it may also be due in part to the age of this bull.

The effect of the presence of leucocytes in the semen is of interest; thus Case 126, in which small numbers of leucocytes were present in the semen, showed a definite slight fall in fructose levels over a four-hour period. Similarly Case 122 showed large numbers of leucocytes, and it is problematical how much of the lowering of the fructose secreted by the *glandulae seminalis vesicularis* is due to a direct effect of the inflammation on the secreting cells, and how much is due also to the utilisation of fructose by leucocytes collecting at the site of infection.

The chief interest lies in the apparent variation in the rate of fructose utilisation as expressed by the fructolysis index. While the group of infertile bulls shows a higher rate of utilisation in the first hour, which falls rapidly, the group of sterile bulls shows only a low rate of utilisation (Cases 123, 124), or delayed utilisation (Case 113). It is unlikely that variation in incubation temperature could account for these changes, and in each case the inability to sire calves was certain, although the number of animals served was small.

Summary

1. The use of fructose estimation in field investigation is described.

2. Results are given for 22 ejaculates from 11 bulls at 13 examinations, and these are compared with general semen characters.

3. Variations in the rate of utilisation of fructose are described.

Acknowledgments.—The writer is greatly indebted to Dr. T. Mann for much helpful criticism and for analysis of the seminal vesicles of Case 127.

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RIOT FOLLOWS ANTHRAX ORDER

The Dar-es-Salaam, Tanganyika, Correspondent of *The Daily Telegraph* reports that three people were killed and eleven, including a European police officer, were injured in riots following a refusal by natives to obey a Government order to inoculate cattle against anthrax. A mob tried to release 17 cattle-owners who had been sent to gaol.

"They demonstrated outside the prison and ambushed a police lorry, releasing eleven prisoners, six of whom gave themselves up again. The Riot Act was read and the police opened fire. The injured European is Captain H. E. Hull.

"The veterinary officer has been under police protection during the last three days after threats had been made against his life."

CLINICAL COMMUNICATION

A CASE OF FAECOLITH IN THE DOG CAUSING ACUTE INTESTINAL IMPACTION

P. Y. STEAD, B.SC., M.R.C.V.S.,
WHITBY

Subject.—Five-year-old collie dog, about 35 lb. weight.

History.—The dog is a notorious wanderer and receives bones from many friends. When first seen he had been ill some days and was stated to have diarrhoea.

Symptoms.—Temperature 101·5° F.; pulse full, firm, about 80 p.m., but very irregular; mucous membranes normal.

Diagnosis.—Non-specific diarrhoea.

Treatment.—Expectant. The dog was given 1½ c.c. "Distaquaine" and 3 grammes sulphamezathine followed by 1½ grammes twice daily.

Course.—On the following day the dog was worse; straining had continued but no motions had appeared. It was apparent that there was no diarrhoea and a search was made for a foreign body. A foreign body was found (beneath the costal arch) which, though not freely movable, could be manipulated back as far as the umbilicus. No pain was shown. The abdomen was flaccid. Temperature 100·5° F.

Operative Treatment.—A mid-line laparotomy was performed under nembutal anaesthesia. The foreign body was found to be in the transverse colon which was completely occluded; the anterior portion was much congested and dilated to a diameter of 2 in. The foreign body was acting as a valve and was held in a contracted ring of healthy colon.

Enterotomy was performed through this ring and the obstruction manipulated backwards through the incision; some chocolate-coloured fluid escaped at the same time.

The intestinal wound was closed by Czerny-Lembert sutures and dressed with 250,000 units of streptomycin and 100,000 units of penicillin.

The abdominal wound was closed with double loop interrupted nylon sutures tied on buttons, the skin being closed with interrupted nylon sutures.

The obstruction proved to be a hard faecal concretion about the size of two walnuts and split transversly into two. No other foreign body could be found but during recovery a similar piece was passed; presumably this latter had been in the rectum during the operation as it came in the first subsequent motion.

Post-operative Course.—Post-operative shock was severe and two doses of 1 c.c. of picrotoxin were given (at 30 minutes' interval) two hours after completing the operation.

Two doses of 1 c.c. each of "Pholedrine" were given intramuscularly during the course of the next day.

On each day 200 c.c. of glucose-saline were administered subcutaneously, 1 c.c. of "Distaquaine" intramuscularly and the dog was given protein hydrolysate by mouth.

After the second day small amounts of food were allowed and recovery was uneventful apart from diarrhoea which persisted about a week.

During the post-operative period the dog received 1½ grammes of sulphamezathine twice daily.

Discussion.—Coprostasis is a common condition in dogs. This case appears to have started as a coprostasis and to have undergone partial self-resolution with an acute impaction developing in the anterior colon while the distal colon emptied itself.

Enterotomy was probably an unnecessary hazard in this case as it is feasible that the faecolith could have been manipulated along the colon to the anus and removed from there. This, unfortunately, was not considered at the time.

ABSTRACTS

Human Infection with C.P.D. Virus *

There is much circumstantial evidence that farm workers, sheep shearers, butchers, etc., are susceptible to infection with the C.P.D. virus, but many cases remain unconfirmed owing to the difficulty of exact diagnosis. The authors report a case of C.P.D. infection in a farmer-pupil which was confirmed by laboratory tests. The lesion took the form of a small vesicular swelling on the brow which grew to about ½ inch in diameter with a thickened surface. There was pre-auricular adenitis, orbital oedema and mild headache. Within two weeks the induration had subsided, but the lesion was still prominent. Two months later the brow showed hyperaemia but no evidence of scarring. Material from the lesion was inoculated into developing chick embryo, and gave a negative result which served to distinguish C.P.D. from the cowpox virus which gives typical lesions on the chorioallantoic membrane. A typical infection resulted in a sheep which was scarified with the same material in the loin. Cross-immunity experiments demonstrated that the strain of virus isolated from the patient was immunologically indistinguishable from a standard strain of the C.P.D. virus. At present this is the only certain method of obtaining an exact diagnosis.

W. L. S.

* **Human Infection with the Virus of Contagious Pustular Dermatitis.** LLOYD, G. M., MACDONALD, A., & GLOVER, R. E. (1951.) *The Lancet.* March 31st. 720-721.

* * * * *

Stimulation of Growth in Pigs by Iodinated Casein and Stilboestrol *

Earlier experiments in which iodinated casein and small amounts of stilboestrol were fed separately to pigs showed only slight stimulus to growth rate. In three experiments a total of 21 pigs (10 to 12 weeks old castrated, males) were fed individually with an adequate diet to which was added 500 mg. iodinated casein and 30 mg. stilboestrol daily. The tests were continued for 19 weeks and the average weight gain and efficiency of food utilisation compared with a similar control group of pigs on the same diet. The treated pigs gained on the average 14·8 lb. more weight and required 0·32 lb. less meal to produce 1 lb. live-weight gain than the control litter-mates. The treated pigs were longer in the leg and probably longer in the body but had less carcase fat than the control animals. The thyroid glands of the treated pigs weighed significantly less, and the acini were smaller than the glands of the controls. The acinar epithelium of the treated pigs showed more low cuboidal types of cell than the controls but in both cases the acini were well filled with colloid.

In a fourth experiment three groups of four pigs were given varying doses of iodinated casein and stilboestrol daily for 19 weeks. The groups received 340, 510 and 680 mg. iodinated casein and 20, 30 and 40 mg. stilboestrol. All groups showed better growth rate than an untreated control group but examination of weight increase during the growing period showed that the low dose appeared to be too low during the latter period of the experiment and the high dose was excessive during the early part of the growing period.

* **Stimulation of Growth in Pigs by Iodinated Casein and Stilboestrol.** BRAUDE, R. (1950.) *Brit. J. Nutrit.* **4.** 138-144.

Concluded at foot of col. 1, page 554

REPORT

[**City of Johannesburg.** Report of Director, Abattoir and Livestock Market Department, for the period July 1st, 1949, to June 30th, 1950.]

This report by the Director, Mr. M. C. Robinson, B.V.Sc., consists of a comprehensive review of the work of his Department, which is what we have grown to expect from Johannesburg. There are six veterinary surgeons employed by the City Council. Apart from the Director, they are the Assistant Director, Dr. E. J. Pullinger, D.V.Sc., M.R.C.V.S., DIP.BACT., Dr. P. J. Meara, D.V.Sc., Messrs. I. Mowat, B.V.Sc., R. K. Loveday, B.V.Sc., and A. A. L. Albertyn, B.V.Sc. The whole staff is composed of 167 Europeans and 170 natives. The two Assistant Veterinary Surgeons, Messrs. Loveday and Albertyn, are seconded to the City Health Department on full-time dairy herd inspection.

During the year there passed through the livestock market 29,765 animals, including horses and mules, whilst 721,897 food animals were slaughtered in the abattoir. The meat condemned amounted to 2,632 tons, most of it being seized for bruising. Cysticerciasis caused much of the destruction of ox offal and of pork carcases. Tuberculosis occupied a low position in the diseases responsible for meat seizure.

The Director complains of a deficiency of mutton supplies due to a sort of "black market" in sheep slaughtering in uncontrolled areas. The consumption of meat *per capita* by city dwellers was about 5·4 oz. per day, whilst in Durban and Pietermaritzburg, where there is a large Asiatic population, the consumption was 4·4 and 3·6 oz. per day respectively.

The report of the Marketing Act Commission set up in 1947 by the Minister for Agriculture and Forestry has not yet been implemented, and the simplification of meat control, regionalisation of abattoirs, modernisation and extension, has not been put into practice. All cattle owned by the Council have been inoculated with anthrax spore vaccine. An outbreak of contagious epididymitis and vaginitis in the Witwatersrand area resulted in movement restriction, as did foot-and-mouth disease near the boundary of Angola, South West Africa, and Bechuanaland. In January, 1950, the Witwatersrand was proclaimed an infected area owing to Newcastle disease in the poultry.

The city is supplied with milk from about 40,000 cattle spread over about 800 farms, some as much as 150 miles from Johannesburg. Inspection of cattle revealed a fairly general tick infestation. Other conditions found were mastitis, contagious abortion, pododermatitis, emaciation and mange. Fourteen cases of clinical tuberculosis were found, and some sporadic cases of lumpy skin disease. An extensive outbreak of paratyphoid fever occurred in one dairy herd. A careful watch was maintained for infectious bovine infertility. At first this disease was regarded as an irretrievable disaster for the dairying industry, but later the disease gradually disappeared. Field experience shows that although serious economic losses are incurred, the consequences are by no means permanent. Initially almost all infected cows are infertile, but after some months most of these regain their fertility, and probably less than 10 per cent. remain sterile. In infected herds fertility was generally regained by symptomatic treatment, and by the introduction of virile young healthy bulls, not necessarily of the dairy breeds.

Veterinary treatment was also given to the Council's animals as well as to those in the Zoo. The Director and his staff are to be congratulated upon a difficult job of work well done.

D. J. A.

Pork and bacon prepared from the treated pigs was distributed to women suffering from menopausal symptoms without any noticeable ill effects, from which it is concluded that the meat from pigs treated with small doses of iodinated casein and stilboestrol probably is safe for human consumption.

F. R. B.

REVIEW

[**The Infectious Diseases of Domestic Animals (with Special Reference to Etiology, Diagnosis, and Biologic Therapy).** By WILLIAM ARTHUR HAGAN, D.V.M., D.Sc., and DORSEY WILLIAM BRUNER, D.V.M., PH.D. Second Edition. (1951.) London: Baillière, Tindall and Cox, 63s. New York: Comstock Publishing Company, $8.00.]

Eight years ago we were grateful to W. A. Hagan for the first edition of "The Infectious Diseases of Domestic Animals." It is to be hoped, and indeed expected, that a similar warm reception will be accorded to the second edition which appears now under the names of W. A. Hagan and D. A. Bruner. Both authors are Professors of Bacteriology at the New York State Veterinary College, Cornell University. Although the book has been expanded it is still a text-book and not an encyclopaedia; it consists of 920 pages of text.

There are seven parts to the book which consider the mechanisms of infection and resistance, the pathogenic bacteria, the pathogenic fungi, the pathogenic protozoa and the viruses; the two other parts deal with chemotherapy and with those agents of uncertain classification such as the spirochaetes, the rickettsiae and the bartonella group. The chapters in these parts consist mainly of discussions of the infectious diseases of animals with special reference to their aetiology. It is not intended to be a text-book of microbiology, although it will be useful to bacteriologists and protozoologists as well as to veterinary practitioners and others who are called upon to diagnose and control animal diseases. A short list of references at the end of each chapter adds to the value of the book, especially for those who wish to read more extensively.

Definitions are always difficult, but that given for the word immunity is not in accordance with most renderings. It is also difficult to assign priority to any individual, but it was F. Griffith of the Ministry of Health laboratory who was the pioneer in the transformation of types of pneumococci; this was recorded four years before the reference given on page 9. There are several other points with which one might find disagreement; diphtheria and tetanus antitoxins are standardised in accordance with an international agreement and it is confusing for the student to be told that the unit of one or the other is the amount which will protect a test animal against certain amounts of toxin; the comparison is the important aspect and what a yard is in terms of measurement is more important than its function. No mention is made under the heading of "Precipitins" of the use made of this phenomenon for the classification and identification of bacteria; no advice is given as to the necessary optimal proportions of the reagents and a lack of appreciation of this may vitiate a result. An account of the distribution and the persistence in nature of *Streptococcus agalactiae* would be a welcome addition, and it is to be hoped that, in another edition, an appreciation of the work on the toxin formed by *Corynebacterium pyogenes*

will be given. The apparent association between the toxins of *C. ovis* and *C. diphtheriae* has surely been explained by the presence of normal antitoxins in the sera under test.

There are many other small differences of opinion between the authors and the critical reader in this country; one expected to read of the value of methylene blue as a stain in the diagnosis of anthrax and it was hoped that the synonyms for *Past. pseudotuberculosis* would have been emended; it is a pity that an error in a former edition of Bergey should be perpetuated and so confuse students.

A pleasing outlook on the part of the authors is displayed by the importance they attach to what the infective agents do in the animal body, rather than what they do in the laboratory. This is well shown by their division of the *Clostridium* group into those which form toxins but do not invade tissues, and the tissue-invading group; *Clostridium welchii* types E and F are omitted. The fungi are similarly divided into those which attack the skin and those which cause mycoses of the internal organs. The virus diseases are, of course, viewed with this outlook and good accounts are given of the well-defined diseases such as swine fever, foot-and-mouth disease and rabies. Infectious canine hepatitis and hard-pad are not forgotten in this section nor are toxoplasmosis and British red water fever in the part on Protozoa.

This is a comprehensive though readable text-book and fulfils the object envisaged; the first edition required five reprintings at least and we expect that this will be an equally popular edition; it deserves to be.

NOTES AND NEWS

Diary of Events

Aug. 30th and 31st.—Clinical Conference, to be held at 83, Buccleuch Street, Glasgow, under the auspices of the West of Scotland Division, N.V.M.A., and University of Glasgow Veterinary School. (See Notice.)

Sept. 5th.—Meeting of the Editorial Executive 1.30 p.m.; Main Committee, 3 p.m.

Sept. 7th.—Meeting of the Overseas Committee, N.V.M.A., 10.30 a.m.

Sept. 7th.—Meeting of the South Wales Division, N.V.M.A., at Aberystwyth, 11.30 a.m.

Sept. 11th.—Meeting of the Technical Development Committee, N.V.M.A., 2 p.m.

Sept. 11th.—Summer Meeting of the East Midlands Division, N.V.M.A., at Thurgarton, Notts. (See Notice.)

Sept. 23rd-29th.—Sixty-ninth Annual General Meeting and Congress of the National Veterinary Medical Association, at Eastbourne.

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N.V.M.A. Congress at Eastbourne

APPLICATION FOR TICKETS

Members are asked to note that ticket application forms for attendance at the forthcoming Congress of the Association were included in the August 4th issue of *The Veterinary Record*. As indicated at the top of the form, applications should be received by the General Secretary not later than September 1st, 1951. Please apply as soon as possible before that date.

GLASGOW VETERINARY SCHOOL ALUMNUS ASSOCIATION

It is proposed to hold the annual lunch of the Glasgow Veterinary School Alumnus Association at the Devonshire Park, Eastbourne, at 1 p.m. on Thursday, September 27th. Tickets for the lunch will cost 10s. 6d. and are available from Mr. R. N. C. Aitken, of the Department of Histology, or, during Congress, from Mr. J. McConnachie Ingram, M.R.C.V.S., Cotswold, Oxted, Surrey.

Golf Competition

Those wishing to enter the competition for the "Simpson" Trophy and the ladies' competition for the "Dunkin" Trophy are requested to notify Mr. N. M. Barrie, M.R.C.V.S., 203, High Street, Lewes, Sussex, who is in charge of the arrangements.

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Arrangements at Slaughterhouses for Dealing with Casualty Animals

The Association is interested in collecting information on various ways in which meat—which might otherwise be suitable for human consumption—is being lost to the country.

It is known that livestock owners, on occasion, send "casualty" animals to the knacker for slaughter because of difficulties experienced in arranging for slaughter through the Ministry of Food or by a private slaughterman. Furthermore, such an owner may receive a better price from the knacker than from the Ministry of Food, which pays only for that part of a carcase suitable for human consumption.

The Association would therefore welcome any evidence bearing on this matter, particularly in rural areas, and members are asked to send any particulars they may have as soon as possible to the General Secretary, N.V.M.A., 36, Gordon Square, London, W.C.1.

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Statement *re Pre-Partum* Milking

At its recent meeting in Edinburgh, Council, N.V.M.A., approved for publication the following statement on *pre-partum* milking.

Certain antibodies, globulins and vitamins occur in greater concentration in the colostrum than in the milk of cows, and the importance of some of these substances in aiding calves to resist various disease conditions is well established.

Accordingly, any system of milking which causes the cow to secrete milk instead of colostrum at the time of calving should be deprecated; nevertheless, when cows are "steamed up" before calving, there may be, in some cases, a justification for relieving the tension on the udder by moderate *pre-partum* milking of the cow.

It is the opinion of the Association that this practice should not be employed extensively or for prolonged periods. It should be confined to animals in which there is exceptional *pre-partum* tension in the udder, causing some discomfort to the animal, and possibly adversely affecting the subsequent milk yield if some of the tension were not reduced.

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Dishorning of Cattle

As also was announced in our last issue, the Council adopted the following resolution sent forward by the Technical Development Committee:—

> "That this Committee, having collected a considerable volume of evidence on various methods of dishorning cattle, expresses disapproval of the method of dishorning involving the use of a ligature whether or not an anaesthetic is given at the time of application, on both humane grounds and lack of efficiency."

In further discussions reported to Council the Technical Development Committee recommended that dishorning must be carried out under an efficient anaesthetic, the choice of which must remain within the discretion of the veterinary surgeon concerned.

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PERSONAL

Appointments.—The following first appointments in the Colonial Veterinary Service are announced: Mr. J. F. Garden, M.R.C.V.S., and Mr. R. C. Nixon, M.R.C.V.S., as Veterinary Officers, Tanganyika.

Mr. D. C. Greene, M.R.C.V.S., Divisional Veterinary Officer, has been appointed Senior Supervising Officer for Co. Tyrone, in place of Mr. R. Moore, who has been promoted Deputy Chief Veterinary Officer.

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LONDON UNIVERSITY TITLE

The title of Professor of Veterinary Anatomy has been conferred on Mr. James McCunn, M.R.C.V.S., M.R.C.S., L.R.C.P., in respect of the post held by him at the Royal Veterinary College.

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R.C.V.S. OBITUARY

CLARKE, A. E., Lieut.-Colonel late R.A.V.C., of Courtyard, Brancaster Staithe, Norfolk. Graduated London, May 18th, 1892. Died August 12th, 1951; aged 80 years.

EDGAR, John Ingram, Major late S.A.V.C., 109, Claremont Road, Forest Gate, E.7. Graduated Edinburgh December 13th, 1895. Died August 14th, 1951; aged 78 years.

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S.V.R. OBITUARY

BILLINGTON, Thomas Hubert, 9, Northcote Road, Stroud, Kent. (V.P.) Grandson of the late George South, M.R.C.V.S., of Bond Street, London. Admitted November 28th, 1949. Died August 13th, 1951; aged 80 years.

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NINTH WORLD'S POULTRY CONGRESS IN PARIS

Over 60 countries, each with its own National Committee, are members of the World Poultry Science Association, which has its headquarters in London, and which held its ninth World Poultry Congress in the University of the Sorbonne in Paris, commencing on August 2nd, with an attendance of nearly 1,500.

Sir Thomas Dalling, Chief Veterinary Officer, was one of the British delegation, and papers were presented by Messrs. Norman Dobson and G. B. Simmins on "The Introduction of Newcastle Disease by means of Frozen Poultry Carcases," and by Mr. J. D. Blaxland on "The Causes of Epidemic Outbreaks of Moniliasis in Turkeys"—all of the Veterinary Laboratory of the Ministry of Agriculture. A paper entitled "The Control of Salmonellosis in Poultry with Special Reference to Fumigation of Incubators" was also presented by Mr. J. E. Wilson, who is in charge of the Ministry's Laboratory at Lasswade, near Edinburgh, and is one of the Scottish members on the World's Poultry Council.

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ADDRESSES OF DISEASE-INFECTED PREMISES

The list given below indicates, first, the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

FOOT-AND-MOUTH DISEASE:

Cumberland.—Scales Farm, Embleton, Cockermouth, Cumberland (Aug. 17th).

SWINE FEVER:

Cambridge.—199, High Street, Chesterton (Aug. 13th); Newlands, Melbourn (Aug. 14th); Church Lane, Isleham, Ely and Norgett's Lane, Melbourn (Aug. 15th); 1, Highfields, Caldecote (Aug. 16th).

Cheshire.—Five Crosses Farm, Frodsham (Aug. 16th); Spout Farm, Mount Pleasant, Mow Cop, Stoke-on-Trent (Aug. 18th).

Derbys.—Dinting Vale Print Works (Aug. 13th); Bromley Moor Farm, March Lane, Sheffield (Aug. 14th); 44, Main Road, Marsh Lane, Sheffield (Aug. 16th); Parkhall Road, Somersham (Aug. 17th).

Hunts.—High Fen, Warboys (Aug. 16th).

I. of Ely.—140, High Street, Chatteris; Bog's Farm, Welney Road, Manea, March (Aug. 13th); Paradise Farm, Witchford Road, Ely (Aug. 15th); Old Halves, Somersham Road, Chatteris (Aug. 16th); 37, Gracious Street, Whittlesey (Aug. 17th).

Lanarks.—Mauldslie Castle, Carluke (Aug. 14th).

Lincs. (Holland).—Drain Bank, Cowbit, Spalding (Aug. 14th); Old House Farm, Broadgate, Westerhills, Spalding (Aug. 15th); Green Dyke, Tydd St. Mary, Wisbech (Aug. 16th).

Middlesex.—Model Farm, Ladygate Lane, Ruislip (Aug. 17th).

Norfolk.—Heath Farm, Gt Massingham, King's Lynn (Aug. 13th); North Creake Aerodrome, Gt. Walsingham (Aug. 16th).

Northants.—Adwell Farm, Culworth, Banbury (Aug. 13th).

Staffs.—Hungersheath Farm, Ashley, Market Drayton (Aug. 13th); Leigh Bank Farm, Tean, Stoke-on-Trent (Aug. 15th); Highfields Farm, Hyde Lea, Stafford (Aug. 17th).

Suffolk (E.).—Castle Farm, Bramfield, Halesworth (Aug. 13th); Street Farm, Bramfield (Aug. 14th); Police Station Meadow, Stradbroke; Grove Farm, Stradbroke (Aug. 16th); Holly Tree Farm, Bramfield, Halesworth (Aug. 17th).

Suffolk (W.).—Ruse's Farm, Little Wratting, Kedington (Aug. 14th).

Warwicks.—Big House Farm, Norton-Lindsey; No. 3, Smallholdings, Baginton, Coventry; New House Farm, Chadshunt, Kineton (Aug. 13th); The Lodge Walls, Hill Road, Allesley (Aug. 14th); Birches Wood, Crackley Lane, Kenilworth (Aug. 15th).

Worcs.—Rookery Road Stores, Headless Cross, Redditch (Aug. 13th).

Yorks (W.R.).—Wilson's Piggeries, Jubilee Gardens, Parkside Road, Bradford; Higher Rawtenstall Farm, Blackshaw Bridge, Halifax (Aug. 13th); Willow Hall Farm, Station Road, Queensbury (Aug. 14th).

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The British Association Meeting

(*Continued from page 540*)

PRESERVATION OF GERM CELLS

In a paper dealing with research on the preservation of both animal and human male germ cells, Dr. A. S. Parkes, of the National Institute for Medical Research, said that very soon "methods will be perfected and fertility will be retained for an indefinite period."

At present, however, methods of freezing at very low temperatures using liquid air (−79° C.), or even liquid carbon dioxide (−196° C.), were not satisfactory in that, while the germs regain motility after long periods of storage, their fertilising capacity was largely lost.

Dr. Parkes warned his audience that the freezing of germ cells was something which would be of value to breeders of pedigree farm animals, but would produce a great outcry when its significance for human beings was realised.

UNDEVELOPED AREAS: PRELIMINARY SURVEYS ESSENTIAL

A joint meeting of the Geology, Zoology, Geography, Economics, Botany and Agriculture sections, held to discuss surveys of undeveloped areas, was told by Professor L. Dudley Stamp that the loss of £36,000,000 on the East African groundnuts scheme and nearly £1,000,000 on the Gambia poultry scheme should be enough to convince all that, apart from any possible political or financial mismanagement, there was at present inadequate knowledge on which to base development schemes in the so-called undeveloped lands, especially in the tropics.

Dr. A. S. Thomas, dealing with "the importance of preliminary surveys of undeveloped areas," said the crops grown and the methods used in their cultivation might furnish a useful guide to the fertility of a region. "So little is known of the interaction of all the factors which control plant growth near the equator," he said, "that any procedure based on the methods of temperate farming may produce very bad results. That is why preliminary surveys, detailed surveys, are essential, and why the more revolutionary the cultural methods to be used, the greater the need for pilot schemes for working in small units."

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the N.V.M.A.

HERD WARRANTY ACTION

Sir,—I am somewhat perturbed that in the legal notes published in *The Veterinary Record* of to-day's date, reference is made by name to two members of the veterinary profession in a recent dispute concerning contagious abortion. I consider it quite improper that names should be quoted at all in connection with a dispute of this kind, as it tends to convey an impression, rightly or wrongly, that the persons so mentioned possess some specialised knowledge of the particular subject under discussion. Moreover, it is quite wrong to present a summary of the evidence given by those two gentleman called on behalf of the plaintiff without reporting in more detail the expert evidence given on behalf of the defence. Several members of the profession, including myself, were called by the defence, and as this party did, in fact, win the case, it is surprising that the report of the evidence given by those veterinary surgeons is condensed to two lines.

I feel, therefore, that the present account is far from complete and the writer has, in fact, omitted the most important point of greatest interest to the veterinary profession. This case might well be of far-reaching importance and the point worth noting is that the result of agglutination tests in a herd where adult vaccinations are carried out will not be accepted by itself as conclusive proof of the presence of active infection. I would have thought that this fact was already well known to the veterinary profession, but if the plaintiff in this instance was acting on the advice of veterinary surgeons when he brought the case to court, this fact deserves even wider publicity. Despite the fact that foetuses and membranes were available for laboratory examination, no microscopic, cultural or biological tests were performed. These tests are, of course, essential for accurate diagnosis in a vaccinated herd, as so many other factors, quite apart from brucellosis, can be responsible for abortion.—Yours faithfully, ARCHD. MCDIARMID, Downe House, Compton, Nr. Newbury, Berks. *August 4th*, 1951.

[We are glad to have this amplification of the report as received by us.—*Editor*.]